MTH401:DISCRETE MATHEMATICS

L:3 T:1 P:0 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: understand methods for constructing and validating logical proofs.

CO2 :: explain recursive techniques for solving problems in combinatorics.

CO3 :: apply the equivalence and partial order relation properties on graph.

CO4 :: understand various graph-theoretic concepts and explore their applications.

CO5 :: apply concepts of planar graphs, Euler's formula, graph coloring, and tree properties in problem-solving.

CO6 :: compute the solution of linear congruences using the Euclidean algorithm.

Unit I

Logic and Proofs : Propositional logic, propositional equivalences, quantifiers, Introduction to proof, direct proof,proof by contraposition, vacuous and trivial proof, proof strategy, proof by contradiction, proof of equivalence and counterexamples, mistakes in proof

Unit II

Recurrence relations : recurrence relation, modelling with recurrence relations, homogeneous linear recurrence relations with constant coefficients, Method of inverse operator to solve the non-homogeneous recurrence relation with constant coefficient, generating functions, solution of recurrence relation using generating functions

Unit III

Counting principles and relations : principle of Inclusion-Exclusion, Pigeonhole, generalized pigeonhole principle, relations and their properties, combining relation, composition, representing relation using matrices and graph, equivalence relations, partial and total ordering relations, lattice, sub lattice, Hasse diagram and its components

Unit IV

Graphs theory I : graph terminologies, special types of graphs(complete, cycle, regular, wheel, cube, bipartite and complete bipartite), representing graphs, adjacency and incidence matrix, graph-isomorphism, path and connectivity for undirected and digraphs, Dijkstra’s algorithm for shortest path problem

Unit V

Graphs theory II : planner graphs, Euler formula, colouring of a graph and chromatic number, tree graph and its properties, rooted tree, spanning and minimum spanning tree, decision tree, infix, prefix, and postfix notation

Unit VI

Number theory and its application in cryptography : divisibility and modular arithmetic, primes, greatest common divisors and least common multiples, Euclidean algorithm, Bezout's lemma, linear congruence, inverse of (a modulo m), Chinese remainder theorem, encryption and decryption by Ceasar cipher and affine transformation, Fermat’s little theorem

Text Books:

1. DISCRETE MATHEMATICS AND ITS APPLICATIONS by KENNETH H ROSEN, MCGRAW HILL EDUCATION

References:

1. HIGHER ENGINEERING MATHEMATICS by B. V. RAMANA, MC GRAW HILL